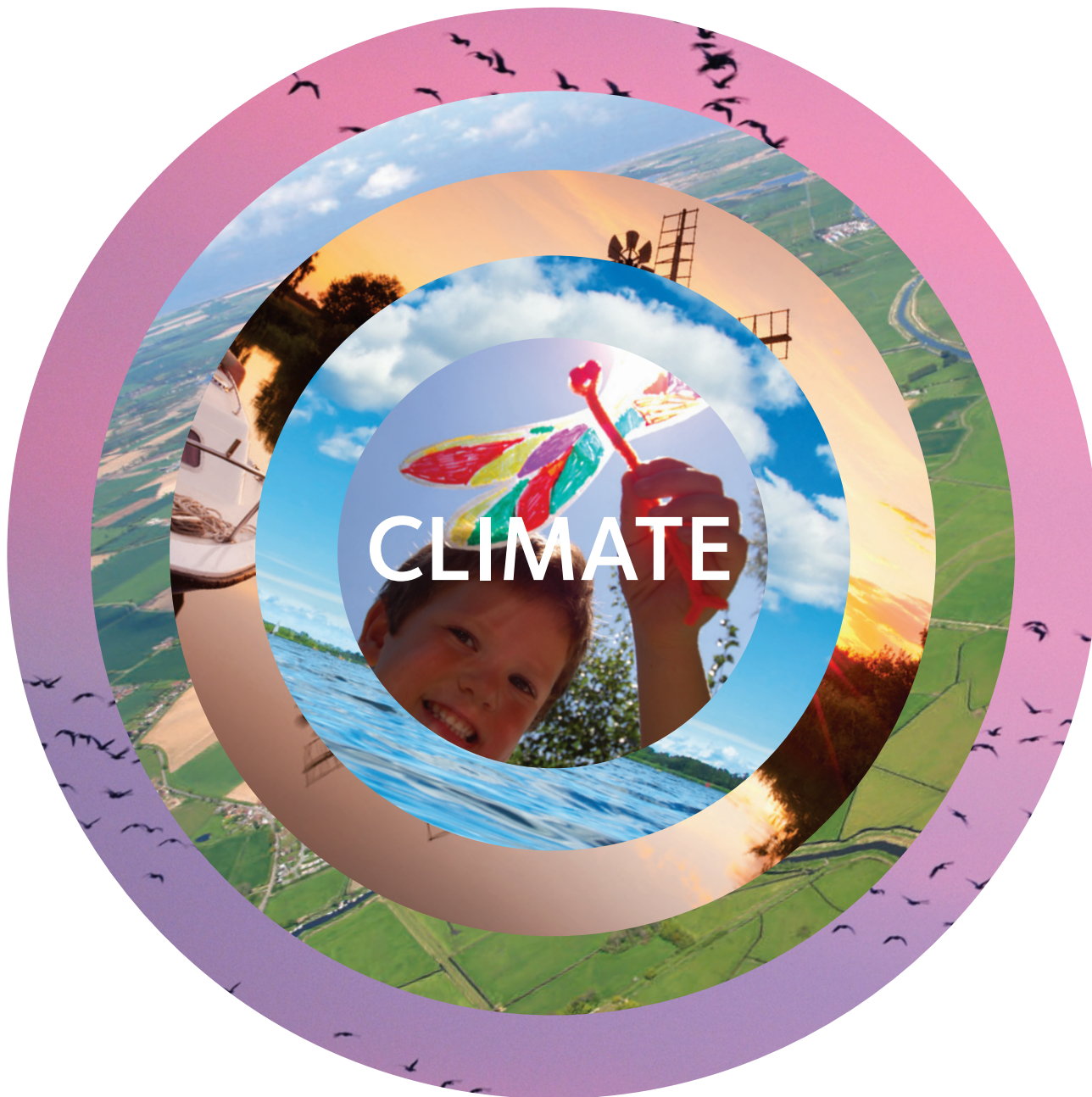


# The changing Broads...?

A summary of the Broads Climate Adaptation Plan 2016



**BROADS**  
**°COMMUNITY**  
*Join the debate*

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Published January 2016

### **Broads Climate Partnership**

Coordinating the adaptation response in the Broads

**Broads Authority (lead), Environment Agency, Natural England,  
National Farmers Union, Norfolk County Council, local authorities,  
University of East Anglia**

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## The changing Broads...

This document looks at the likely impacts of climate change and sea level rise on the special features of the Broads and suggests a way forward. It is a summary of the full Broads Climate Adaptation Plan prepared as part of the UK National Adaptation Programme.

To get the best future for the Broads and those who live, work and play here it makes sense to start planning for adaptation now. The 'climate-smart' approach led by the Broads Climate Partnership seeks to inspire and support decision makers and local communities in planning for our changing environment. It is supported by a range of information and help available through the Broads °Community initiative (see page 18).



'Big skies' at Horse Mere  
and windpump

# 1 The changing Broads

The Norfolk and Suffolk Broads is a unique and internationally important wetland. A member of the UK family of National Parks, the Broads is designated for its landscape, nature conservation and cultural features. It is enjoyed by its residents and millions of visitors for its tranquil, 'big skies' landscape and recreational opportunities on land and on 200km of navigable waterways.

The Broads is a dynamic, living landscape, shaped over centuries by nature, people and climate. Over the next century it will continue to change. In particular, its low-lying nature and closeness to the East coast makes the Broads, a predominantly freshwater habitat, particularly vulnerable to the impacts of climate change and sea level rise.

These impacts are likely to become increasingly significant as we move through the coming decades, affecting our water resource, habitats and species, built heritage, navigation, property and infrastructure, agriculture and tourism.

This summary of the Broads Climate Adaptation Plan outlines the likely impacts of climate change and sea level rise on the Broads and considers adaptation responses.

(For more information on the full plan, see page 18 of this summary).



In 2014 there were approximately 7.7 million visitors to the wider Broads National Park area

# 2 The changing climate

We all notice the changes in our day-to-day weather and short-term variations in our climate, such as the recent winter storm events.

Climate change science, on the other hand, analyses the average weather trends or cycles at a particular place over much longer periods of time, generally around 30-50 years.

Climate science has been evolving for decades, using evidence from the past and computer modelling to project what is likely to happen in the future. While climate prediction modelling is extremely complex, with many variables to be considered, modelling results are coming closer and closer together.

Based on probable climate projections, over the coming 50 years the Broads is likely to see:

- Hotter, drier summers with more cloud-free days and future average temperatures closer to current *maximum* temperatures, and possibly extreme rainfall events.
- Slightly wetter, warmer winters with rainfall in more intense bursts.
- Streams and the sea getting warmer, with associated changes in wildlife and water patterns.
- More extremes in the intensity and frequency of rainfall and storms, and possibly heatwaves and drought. These could coincide with surge tide events, creating still higher flood levels.

Sea level is rising due to land settlement. In addition, the expansion of water as it warms up suggests that sea level will be at least 30-40cm higher, possibly over a metre higher by the end of the century if greenhouse gas emissions are not reduced rapidly. If climate 'tipping points' of irreversible change are reached, perhaps enabling lots of polar land ice to melt, sea levels could be much higher.

### 3 A climate-smart response

*While there may be uncertainty about the rate and magnitude of climate change over the coming decades, ‘uncertainty paralysis’ needs to be avoided. Changes are already occurring and will continue to occur. The decision should not be whether to begin preparing for change, but how much change to prepare for.... it is often cheaper to design for a change than to retrofit for the change later.*

Dr Jeff Price, Tyndall Centre, University of East Anglia

The uncertainty about climate change should not be a reason to avoid preparing for it. However, we need climate adaptation responses that are robust, informed and flexible. To help develop adaptation planning in the Broads we are suggesting using a ‘climate-smart’ approach.

Climate-smart planning can be done at a small, local site level (such as a farm, nature reserve or tourist attraction) or a larger organisational level (such as a recreation strategy, habitat or species recovery plan, or spatial planning policy). In simple terms it is about adding climate adaptive thinking to our management planning cycle (Fig.1).

The long-term aim of climate-smart planning is to sustain the natural environment and the multiple benefits it provides for people and nature. Adaptive actions should also seek to reduce greenhouse gas emissions and improve evidence and understanding of climate change processes and impacts.

We can test whether our plans will help us adapt to changes in weather, climate change and sea level rise by:

- Focusing on future possibilities rather than trying to retain the past
- Being flexible enough to cope with climate uncertainties
- Addressing climate impacts alongside other pressures, such as changes in food production or trends in tourism
- Considering what to do locally within the context of the wider landscape
- Avoiding adaptation actions that actually makes (other) things worse – sometimes known as ‘maladaptation’

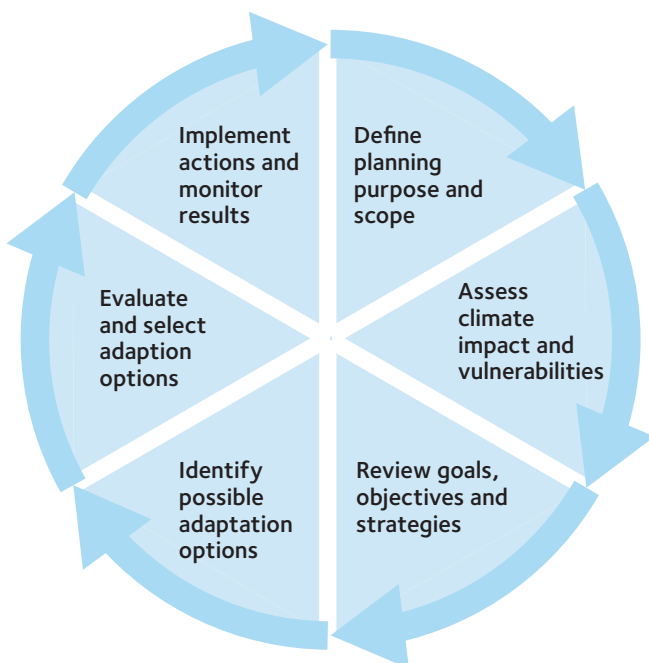


Figure 1 Climate-smart planning cycle<sup>1</sup>

<sup>1</sup> Adapted from ‘Climate-Smart Conservation: Putting Adaptation Principles into Practice’ (National Wildlife Federation, 2014)

## 4 Being climate-smart in the Broads

When people are asked why they love the Broads, the 'special qualities' most commonly mentioned include: Rivers and open water bodies ('broads'); fens, reed beds and wet woodlands; grazing marshes and ditches; estuary and coast; navigable, lock-free waterways; farmland; abundant wildlife; historic structures, especially mills; countryside access on land and water; and the sense of tranquillity, wildness and 'big skies'. Although this plan dwells on these special qualities, the wider needs of people, especially our local communities, also needs to be at the forefront of thinking.

To develop our climate-smart planning approach for the Broads, we have looked at likely climate impacts on these special qualities, and potential vulnerabilities and adaptation opportunities (Table 1, page 7)

For the most significant impacts we consider what could be done to get the best for the Broads in adapting to the likely changes.



Iconic features of the Broads:  
Bittern (left) and wherries in full sail (right)

We also propose adaptation actions that could help now, while not restricting future choices that may be available as climate understanding continues to improve.

These and other options would obviously need to be considered in detail, and there are likely to be some difficult and complex decisions ahead.

Many adaptation choices will need long-term planning to gain necessary agreements, change practice or policy, or gather more evidence of what may be possible or acceptable. Reaching a consensus on some actions will be very challenging, with many different interests and needs to be considered.

We know that one of the most significant challenges likely to face the Broads is the management of flood risk. At the same time, we need to recognise that change will also bring opportunities to enhance the Broads.

As a starting point for debate and evidence gathering, we have assessed the potential of some of the short-term priorities and longer-term goals for managing this risk (Section 5, page 12).



**Table 1** Main climate impacts and preliminary possible adaptation options  
(Cost and challenge: 1 = low, 5 = high)

| Climate event                                      | Significant climate impacts and vulnerabilities on the area's special qualities               | Some possible adaptation options   | Indicative cost | Indicative challenge | Some possible 'low regret' adaptation actions  |
|--|---|--|-----------------|----------------------|--|
| <b>A. Hotter drier summers</b>                     | 1. Lack of water for abstraction and the environment along with lack of water to flush rivers | i. Alter water abstraction licensing or processes  | 2               | 2                    | a. Continue review of abstraction licencing to seek sustainable solutions for the environment and users  |
|  |   | ii. Hold back water within the floodplain by altering surfaces, and/ or adopting more integrated, whole catchment water management | 2               | 2                    | b. Promote grants to create farm reservoirs and processes to hold back water   |
|  |   | iii. Reduce levels of nutrients/ pollutants throughout so low flushing of rivers is less damaging                                  | 3               | 3                    | c. Improve monitoring to understand sources and flows of pollutants<br>d. Identify the most sensitive habitats requiring adequate water supply<br>e. Explore opportunities to store water in floodplain giving multiple benefits |
| 2. Changes in species mix and growth               | i. Change habitat and species management  | i. Change habitat and species management   | 1               | 2                    | a. Review site management plans and change goals or management as appropriate  |
|  |   | ii. More appropriate water management for multiple needs   | 2               | 1                    | b. Trial experimental conservation techniques  |
|  |   | iii. Relocate species to areas where conditions are more suitable (results are likely to be long term)                             | 3               | 4                    | c. Assess potential for and trial relocation of key habitats   |
| 3. Changes in tourism patterns and visitor numbers | i. Identify sites vulnerable to disturbance and invest in better visitor management           | i. Identify sites vulnerable to disturbance and invest in better visitor management  | 1               | 2                    | a. Develop tourism vision and advice to steer future investment  |
|  |   | ii. Provide clear guidance so market forces can develop suitable response  | 1               | 2                    | b. Scope opportunities to extend/enhance tourism offer<br>c. Promote mechanism for sustainable growth/ development to contribute to conservation management  |

| Climate event  | Significant climate impacts and vulnerabilities on the area's special qualities           | Some possible adaptation options   | Indicative cost | Indicative challenge | Some possible 'low regret' adaptation actions   |  |
|--|---|--|-----------------|----------------------|---|--|
| <b>B. Warmer wetter winters</b>  | 4. Drying of ground and materials, affecting historic environment and landscape character | i. Review/revise water management on site  | 2               | 2                    | a. Through historic environment agencies, identify main risks and provide guidance within planning system             |  |
|  |   | ii. Proactively protect structures/assets  | 3               | 3                    | b. Develop scheme to record asset details to monitor change and create legacy if asset lost                           |  |
|  |   | iii. Carry out more recording to retain knowledge of assets                              | 1               | 1                    |   |  |
|  | 1. Less die-off of pest and diseases  | i. Breed for disease resistance  | 4               | 4                    | 4   | a. Improve risk assessments and plan further ahead   |
|  |   | ii. Modify management practices (cross relate to other needs)                            | 1               | 2                    | 2   | b. Reduce other stresses so there is greater ability to resist disease /pests  |
|  |   | iii. Minimise other threats to help keep healthy populations                             | 2               | 2                    | 2   | c. Monitor for natural resistance within species   |
|  | 2. Higher peak and resting water levels possible  | i. Increase scope and height of flood defences recognising the water has to go somewhere | 4               | 4                    | 2   | a. Model river levels taking account of worst case climate impacts and assess issues                                 |
|  |   | ii. Allow higher water levels generally with associated management practices             | 2               | 3                    | 3   | b. Identify impacts on bridges of higher water levels. Review what other facilities might need to alter              |
|  |   | iii. Alter navigation infrastructure   | 3               | 3                    | 3   | c. Explore opportunities for storing excess water to use at other times of year                                      |
|  | 3. Changes in species mix and growth including greater survival of pests and diseases     | i. Modify management processes   | 1               | 2                    | 2   | a. Review site management plans and change goals or management as appropriate (including for invasive alien species) |
|  |   | ii. Revise site objectives   | 1               | 1                    | 1   | b. Revise farming aspirations to cope with pests   |
|  |   | iii. Alter/ improve water control in line with natural processes                         | 2               | 2                    | 2   |  |
| iv. Modify cropping / livestock procedures to cope with invasive pests and alien species |   | 2  | 2               | 2                    |   |  |
| 4. Changes in tourism patterns and visitor numbers                                       | i. Provide clear guidance so market forces can develop suitable response                  | 2  | 2               | 2                    | a. Develop vision for tourism industry  |  |
|  | ii. Plan for growth in length of tourism season   | 1  | 1               | 1                    | b. Provide clear guidance and advice on acceptable developments that are environmentally and economically sustainable |  |
|  | iii. Increase investment in visitor management  | 2  | 2               | 2                    | c. Enable developer contributions from growth to help site management   |  |



| Climate event  | Significant climate impacts and vulnerabilities on the area's special qualities                             | Some possible adaptation options  | Indicative cost | Indicative challenge | Some possible 'low regret' adaptation actions   |
|--|---|---|-----------------|----------------------|---|
| <b>C. Sea level rise</b>   | 1. Flooding of land and associated impacts (e.g. on infrastructure) primarily through overtopping or breach | i. Strengthen coastal defences  | 4               | 4                    | a. Further studies on implementation of Shoreline Management Plans<br>b. Share case studies on relocation projects/ costs<br>c. Raise awareness of vulnerable people to adaptation options  |
|  |   | ii. Install localised site specific protection  | 3               | 3                    |   |
|  |   | iii. Implement realignment schemes  | 3               | 3                    |   |
|  |   | iv. Relocate vital assets   | 4               | 5                    |   |
|  | 2. Increasing salinity in predominantly freshwater system   | i. Introduce salt barriers (and associated water management)                          | 5               | 4                    | a. Carry out high level financial and technical review of barrier options<br>b. Continue to investigate new technological options to provide protection from saline intrusion<br>c. Review site management plans and legislative constraints for Natura2000 sites |
|  |   | ii. Review objectives to accommodate more salty conditions                            | 2               | 4                    |   |
|  |   | iii. Modify management practices to deal with new salt levels (amounts and locations) | 2               | 3                    |   |
|  | 3. Changes to other water levels (including indirect)   | i. Create overspill areas to accommodate excess water                                 | 3               | 3                    | a. Develop solutions to problems with landowners, particularly through catchment approaches/ Water Framework Directive<br>b. Review Local Plan policies   |
|  |   | ii. Use localised defence structures to maintain levels                               | 3               | 3                    |   |
|  |   | iii. Move vulnerable habitats/historic buildings to new locations as a last resort    | 5               | 4                    |   |
|  |   | iv. Review objectives to allow higher water levels                                    | 2               | 2                    |   |
|  | 4. Squeeze of marine habitats against barriers  | i. Consider realignment of existing barriers  | 5               | 5                    | a. Build in sufficient room for change in all new designations and/or coastal defence schemes<br>b. Identify potential areas for new coastal habitat so land managers can consider if that option is viable in future planning                                    |
| ii. Create new areas of coastal habitat to compensate loss elsewhere |   | 5   | 5               |                      |   |

| Climate event            | Significant climate impacts and vulnerabilities on the area's special qualities | Some possible adaptation options   | Indicative cost   | Indicative challenge | Some possible 'low regret' adaptation actions  |
|--------------------------|---|--|---|----------------------|--|
| <b>D. Extreme events</b> | 1. Sediment washed off land into waterways or onto other land                   | i. Manage site to minimise sediment loss   | 2   | 2                    | a. Use Water Framework Directive to implement multiple benefit projects  |
|                          |   | ii. Proactively manage catchment/ waterways and infrastructure to prevent sediment run-off and create sediment buffers | 3   | 2                    | b. Provide advice on funding support through Catchment Management Plans  |
|                          | 2. (Flash) Flooding of land and infrastructure more likely                      | i. Increase scope and height of defences   | 3   | 3                    | a. Integrate Catchment Flood Management Plans and Surface Water Management Plans to identify priority locations for action |
|                          |   | ii. Develop temporary flood areas  | 3   | 2                    | b. Promote best practice advice for 'holding up' water in catchment  |
|                          |   | iii. Increase opportunities to hold water upstream and improve percolation into the ground                             | 2   | 2                    | c. Develop new funding routes to improve water management  |
|                          |   | iv. Improve advance warning and advice   | 1   | 1                    | d. Revise Water Level Management Plans to gain multiple benefits   |
|                          | 3. Tidal surges created by weather systems and high tides                       | i. Build potential surge extremes into modelling and adapt Shoreline Management Plans accordingly                      | 4   | 4                    | a. Review existing tidal surge data, model possible impacts with recent extremes built in to identify vulnerabilities      |
|                          |   | 4. The cumulative effects of unusual weather patterns putting coping strategies under stress                           | i. Build in (further) contingency to cope with extremes | 1                    | 3  |
|                          | ii. Review and amend current goals and objectives to cope better with extremes  |  | 1   | 2                    | b. Make vulnerable wildlife and heritage sites more robust and resilient including lessening other stresses                |
|                          | iii. Improve awareness of risks and best practice responses                     |  | 1   | 1                    |  |

Table 2 shows an example of typical responses to change, for one particular scenario – a boatyard owner facing increased flood risk.

Broads °Community will develop other scenario responses, which will be placed on the website and available on request, to help different sectors of the community relate and contribute to the ideas.

**Table 2** Example of climate-smart planning at a local level

| Example: Boatyard business  |   |  |
|---|---|--|
| Responses   | Potential actions   | Considerations   |
| Resist the change and make alterations to keep things the same                | Accept yard will flood but build in higher levels of defence – e.g. raise flood walls, lift vital items off floor level, move electric points higher, invest in more rapid restoration plans  | To keep roughly same level of operation we would need to keep flood waters out or alter factors that would be affected. Not all floods can be resisted but improvements could mean business time lost remains ‘average’ and acceptable.                            |
| Accept the change and make no alterations                                     | Accept yard will flood and continue to use existing restoration procedures to get back to operational level   | Our flood response procedures work ok now, but with a very different regime in future (e.g. more flood events, higher water levels) the current procedures could be inadequate.  |
| Accept the change and make alterations to get the best from the new situation | Change flood defences to much higher level of protection; channel flood water to known location, perhaps for reuse; alter yard configuration to reduce risk to people and property; modify buildings so flood impacts are minimal and rapid restoration can occur | What could we do to get best from the situation – e.g. could excess water have a beneficial use somewhere? How can we change things so flood impacts are less significant – e.g. buildings/storage levels that rise and fall with water levels?                    |
| Accept the change and alter goals, objectives or strategies                   | Review viability of yard and modify business, from moving location to altering business model (e.g. to floating maintenance docks). Make changes in advance or wait for trigger points to be reached  | Projected changes suggest that at a future point our current business will not be viable. Is it realistic to move? Can we change what we do or how we do it? Can we predict how far in advance our business model has to change? What would our trigger points be? |

## 5 Managing flood risk

Managing water resources is obviously central to the Broads wetland environment. With 95% of the Broads Authority Executive Area lying within the floodplain and its proximity to the coast, flood risk is a specific major issue.

As a starting point for debate we have made an initial assessment for managing this risk, using the steps in the climate-smart planning cycle.

### 5.1 Planning purpose and scope

- To identify flood risk adaptation options for the Broads within the wider context of the rivers catchment, coast, and urban and rural surrounds
- To evaluate adaptation options against desired goals, objectives and strategies.

### 5.2 Climate impacts and vulnerabilities

- The sea overtopping or breaching defences and/or surging up the rivers
- Squeeze of coastal habitat as it becomes eroded by the sea and cannot move past existing barriers
- Excessive rain, which may also be held back by the tide, overtopping and breaching defences
- Ground and surface water flooding
- Extreme weather events in combination, such as storms with high tides and heavy rainfall, affecting how defences (such as existing flood walls) cope with the situation

The likely impacts on the area's special qualities include:

- Flooding threats to life, property and infrastructure
- Increased pollutants and excess nutrients, sediments and salinity in the rivers and broads
- Greater pressures on water resources
- Loss of coastal habitat
- Loss of river habitats
- Changes in the distribution, mix and growth of species
- Changes in visual landscape character, including archaeological and built heritage features
- Changes in agricultural patterns and production
- Changes in tourism patterns and visitor numbers



Overtopping at Postwick Marshes, River Yare

## 5.3 Current goals, objectives and strategies

A wide range of bodies have roles and responsibilities for managing flood risk in the Broads and along the Norfolk and Suffolk coast.

The **Broads Authority** manages the Broads for conservation, recreation and navigation. As the local planning authority it controls development in the area, primarily in the flood plain, and advises on matters such as sustainable building design.

The **Environment Agency** manages flood risk from the main rivers, estuary and the sea, and is responsible for river and tidal flood defences.

**Norfolk and Suffolk County Councils** are the Lead Local Flood Authorities, managing flood risk from surface water, ordinary watercourses and groundwater.

**Water and sewerage companies** manage the risk of flooding to water supply and sewerage facilities and the risk to others from the failure of their infrastructure, and **Internal Drainage Boards** manage land drainage in lowland areas. These organisations also have a role to play in encouraging communities to participate in flood risk management at their local level.

The long-term aim for the Broads in response to climate change and sea level is that:

All of the key agencies believe that the Broads will remain a special area, retaining its wildlife and heritage importance and continuing to offer extensive recreation and socio-economic opportunities. Longer-term aspirations and decisions will be informed by robust evidence and wide ranging debate on the most appropriate management options.

**Broads Plan 2011**

This aim was furthered by a resolution from the Broads Authority taken in January 2014 that states:

*“(Tidal) surges pose a critical threat for both Broads’ communities and the protection of the very precious freshwater ecology that makes the Broads so special. We recognise the considerable amount of investment made in flood protection and stress the importance of preventing salt and saline intrusion.”*

13km of frontline sea defences between Eccles and Winterton protect the Broads from flooding directly from the North Sea, as part of the Kelling to Lowestoft Shoreline Management Plan.



### Where the rivers meet at Breydon Water

Currently, there is a ‘hold the line’ policy approach to maintaining the beaches and existing sea defence structures along this frontage. By later in this century, this will become conditional depending on the climate, and other management approaches will need to be considered if the ‘hold the line’ position becomes unsustainable.

Each time a managed approach is put off, the likelihood of an unmanaged change increases. It is therefore vital to continue evidence gathering to monitor and predict future conditions.

Further inland, the Broadland Flood Alleviation Project 2001–2021 is strengthening and maintaining existing flood defences and making new provisions for undefended communities in the Broads. What happens beyond 2021 is still to be determined.

## 5.4 Possible adaptation options

As a starting point for discussion and for research and evidence building, we look at seven potential adaptation responses to flood risk (Table 3).



‘Broads Future’ YouTube video produced to stimulate community debate about managing flood risk in the Broads. See Broads °Community web page for link - details page 18



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**Table 3** Assessing adaptation options for managing flood risk in the Broads

|   | Possible adaptation options   | Considerations   |
|---|---|--|
| a | Make incremental additions to existing flood protection as conditions dictate. May be achieved through management change (e.g. altering the levels and uses of sluices) but more likely to require technological/ built solutions to maintain current situation.  | <p>May initially appear lower cost option but as each incremental cost is added may become high cost over time, which could mask underlying increase in risks and be false economy.</p> <p>Many experts believe ‘business as usual’ approach would not provide necessary risk management. Changing conditions may create very technical challenges and require increasingly complex solutions.</p> <p>Creates potential for increasing inequality as poor and small communities receive less favourable solutions.</p> |
| b | Accept there will be increased fresh and salt water flooding leading to (slow) change of freshwater habitat to brackish and saline, coastal habitat squeeze, increased impacts on and constraints to riverside economy and recreation. Minimise threat to life and property through advanced warning systems. | Dwells on unmanaged change. Unlikely to be acceptable option to local people, visitors and, to certain degree, current legislation as planned approaches should bring wider benefits.  |

|   |  |  |
|---|--|--|
| c | <p>Find new places to direct excess water (make space for water) along catchment, avoiding increased threat to people. Increased flood protection at a local level (such as around individual properties, small settlements or very valuable land) by individuals/communities or through public bodies.</p> <p>Promote more integrated catchment scale water management to use freshwater excess to minimise potential for drought impacts.</p>                                  | <p>Likely to be medium cost; would require new uses for land to retain economic viability; could enhance some services (e.g. wildlife, recreational opportunities); and could be gradually introduced as conditions altered.</p> <p>More integrated water management would bring multiple benefits but would require new governance processes.</p> <p>Likely to create significant challenges for freshwater habitats seeing gradual move towards brackish and salty conditions.</p>   |
| d | <p>Increase protection through construction of rigid defences. This may be localised raising of flood walls, strengthening of sluices and bridges, etc., but may also include more significant protection through provision of barrier(s) to prevent sea inundation.</p> <p>While raised barriers keep flood water out, the water has to go somewhere. This suggests that over time other defences will have to increase in coverage and potentially in height and strength.</p> | <p>Likely to be high cost; may require high quality modelling and widespread forward planning to ensure problems not transferred elsewhere; likely to provide feeling of greater security for area and people; could be tackled incrementally (topping up as needed), although to get wide protection extensive work might be needed.</p> <p>Multiple benefits might accrue from barrier approach but there are technical challenges to ensure processes continue appropriately (e.g. passage of boats, getting balance right to allow brackish areas to remain as such) and high financial burdens.</p> |
| e | <p>Seek to relocate features unable to cope with changing conditions: Move upstream, to higher ground, or away from area of risk completely. Some elements would become impossible over time, e.g. boat passage under low bridges.</p>   | <p>Likely to be medium to high cost, take long time to happen and be very challenging for certain habitats. This may not be possible for elements of the historic environment, especially archaeology. Would also create challenging governance issues.</p>  |
| f | <p>Accept that new conditions will prevail and current goals and objectives need to change. Likely to relate primarily to managing land and water in different way for different outcomes.</p>   | <p>Likely to be low to medium cost. By accepting there are inevitable climate impacts that make original goals difficult, new goals can take clear account of changing climate, allowing simpler approaches to coping and so reducing costs and technical challenges.</p>  |
| g | <p>Technological changes may be directed mostly at human infrastructure (health, education, nutrition) and properties. Instead of seeking to protect riverside properties, repeated flooding could be accepted, with objective to minimise time spent out of action and waste of resources in dealing with aftermath.</p> <p>At this stage options may seem limited and innovation and fresh approaches would be needed.</p>   | <p>Likely to be low to medium cost. By accepting there are inevitable climate impacts that make original goals difficult, new goals can take clear account of changing climate, allowing simpler approaches to coping regimes and so reducing costs and technical challenges. Innovation may be slow due to relatively low number of properties/businesses impacted.</p>   |

## 5.5 Evaluating and selecting adaptation options

We would clearly need more information and stakeholder discussion to evaluate the above options fully. However, this simple analysis suggests that option (b) would be unacceptable, and the high cost and technically challenging options are not ideal. Revising current goals or policies may have merit, provided adaptation actions for one requirement would not worsen impacts on something of equal or greater value. Short-term actions to retain the existing special features of the Broads may be preferable, particularly 'low regret' actions that would not have unacceptable costs or adverse knock-on effects, or severely restrict future adaptation choices.

Our conclusion from this preliminary exercise would be to seek to retain the freshwater elements of the Broads for the time being, in line with current policy. At the same time, we urgently need to apply 'climate-smart' thinking to planning and major investment and improve our knowledge about adaptive choices that consider costs and benefits and retain the Broads as a special place, even if we may have to accept that it will not stay the same.

The previous research on engineered barriers must be revisited to understand the technical and financial options relating to current modelling. If there are realistic solutions, seeking the necessary finance and permissions will take time. If the solutions are not practicable or affordable, efforts can be directed at finding alternatives.

Implementing short-term 'low regret' projects will help inform longer-term approaches.

We also need to identify what evidence needs to be collected to improve our understanding about climate impacts and solutions. This should cover the natural and historic environments as well as existing buildings and infrastructure.



Flooding at Potter Heigham, River Thurne



## 5.6 Taking the process forward

1. Establish constructive discussions with the Environment Agency and coastal and lead flood risk authorities on research needed to inform a detailed options appraisal.

This would include:

- Refreshing the analysis of costs and feasibility for barriers to restrict saline incursion
- Initiating the debate about flood protection after the Broads Flood Alleviation Project ends, to have a clear set of options by 2018
- Creating alternative high level scenarios (long-term, 50 years) for the most vulnerable parts of the Broads and coast

2. Provide clear, high quality information to inform public debate about future visions and options for flood management (including information on the natural and historic environments, as well as economic and social needs).

3. Incorporate into the next Broads Plan (to be published in 2017) strategic objectives for water, especially flood risk management, that are more responsive to climate change and sea level rise, supported by the key agencies.



Flood bank construction, Haddiscoe Cut



Bank re-profiling, Breydon Water

## 6 Next steps

This summary and the full Broads Climate Adaptation Plan will be submitted to Government to inform the UK National Adaptation Programme.

The plans were prepared by the **Broads Climate Partnership** led by the Broads Authority with representation from Natural England, National Farmers Union, Norfolk County Council, Environment Agency, local authorities and University of East Anglia.

Over the next three years (2016-19), the Partnership aims to:

- Submit the Broads Climate Adaptation Plan to Government
- Work with as wide a range of organisations and communities as possible to develop locally specific climate-smart planning and good practice
- Explore ways to evolve coastal and inland flood risk management across a wide area, through shared responsibility and action
- Build evidence and share understanding on climate impacts and adaptation options
- Implement and monitor 'low regret' adaptation actions
- Incorporate climate-smart planning into the next Broads Plan (2017) and promote the approach in partner plans and strategies

To support these aims we have set up the Broads °Community initiative, to involve everyone with an interest in the Broads in discussing and planning for a climate resilient future.

If you would like further help with your own climate-smart approach or have ideas to share with the Broads °Community, please get in touch.

**Write to**  
**Broads °Community**  
**c/o Broads Authority**  
**62-64 Thorpe Road**  
**Norwich NR1 1RY**

**Email**  
**Broadscommunity@broads-authority.gov.uk**

**Visit the web site**  
**[www.broads-authority.gov.uk/looking-after/climate-change](http://www.broads-authority.gov.uk/looking-after/climate-change)**

where you can also find the summary and full Broads Climate Adaptation Plan

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*Join the debate*

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°COMMUNITY**

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